VOLUME VIII July, 1915, NUMBER 3

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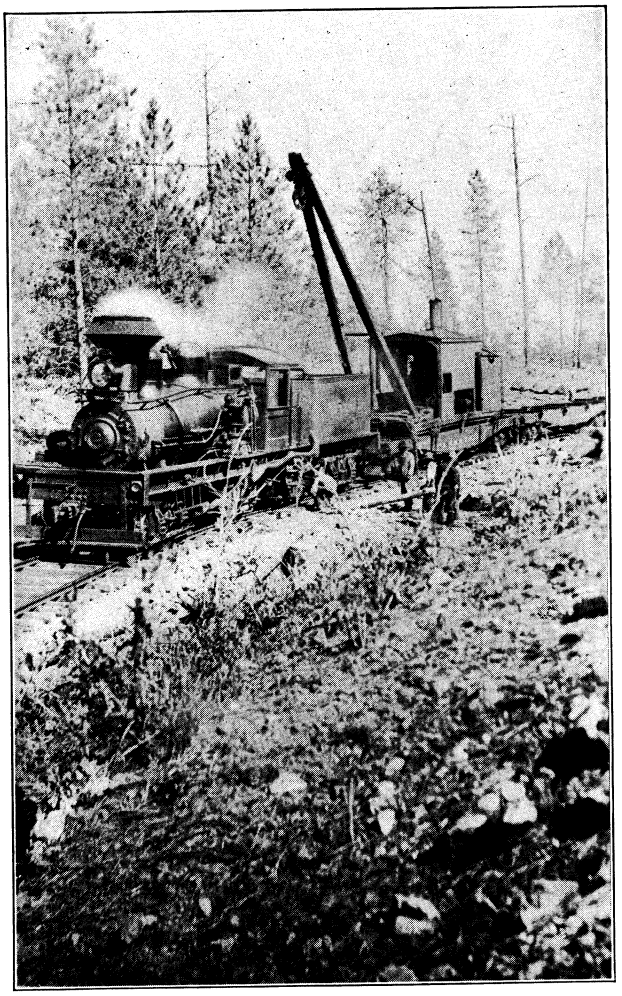
Logging, Plantation, Mining, Industrial & Standard Railroad Motive Power.

SHAY Locomotives



In the Woods of the American Lumber Co.—70 Ton Shay Locomotive Spotting Cars and Loader for Loading Logs

Are Particularly Adapted for All Around Logging Work

Shay Locomotives have the greatest tractive power consistent with their weight. They are adapted for heavy grades, sharp curves and light rail. Their steady draft, due to the great number of exhausts, makes fuel combustion low—hence, unusually economical in fuel.

We've an unusually attractive catalog about Lima Locomotives. Shall we forward a copy?

Lima Locomotive Corporation

Builders of

Locomotives of All Types

Lima, Ohio

VOL. 8, No. 3 LIMA, OHIO July, 1915

THE LOCOMOTIVE WORLD
PUBLISHED MONTHLY BY
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THE FRANKLIN TYPE AND PRINTING COMPANY

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Systematic Valve Setting on Locomotives

BY J. R. BRITTON

Paper read before the April meeting of the Canadian Railway Club. In it the proposal that the setting of valves on locomotives be so standardized that more uniform results would follow in the work of several groups about a shop having this work in hand, or where a single group or individual may be responsible, the faults or errors persisted in by that individual or group may be eradicated.

Locomotive valve setters in the past have been left very much to their own resources, thus allowing various methods of valve setting with more or less difference in the results obtained.

Systematic valve setting, when commonly understood and agreed upon, would insure definite methods which would be definitely stated to cover each design of valve gear on the various classes of engines, in order to develop maximum power and speed when working in the reverse gear position, where most work is done. It would also embrace an information sheet being given to the valve setters, pertaining to lead specifications and other necessary points to be observed during valve setting. Some time ago a step was made in this direction by issuing information sheets giving specified full gear lead for the various classes of engines in the Canadian Pacific Railway's Angus shops. The system recommended is to carry this still further and cover definitely all other necessary details relating to valve setting and to allow of a common practice to be observed by all. This would be supplemented by a printed work report, this would be in itself a fair guide to the uninformed. This would be filled in by the man setting the valves which would render a statement of the various points necessary for accurate valve setting and show that they had been properly observed. Lead and full gear port openings would be noted on work report, thereby exposing any deviation from specifications immediately, which could be taken care of before engine left for an outside point.

Valve setting is among the most important work in connection with the construction or repair of a locomotive. In the past the tendency has been to set the valves on all classes of locomotives, i.e., freight, switch and passenger engines, more or less alike, but this system would allow of a definite valve setting to suit the conditions under which each class of engine works. When a locomotive is taken into a shop for general repairs its motion is care-

fully inspected and all worn parts requiring repairs are taken care of by the machine shops. After this it is returned to the erecting shop, where it is re-assembled and put up, either by the man who is to set the valves or under his supervision. With such system all parts would have to comply with the standard instructions and in addition to this the valve setter would be expected to check the location and lengths of parts of valve gear, particularly the reverse shafts, reverse shaft arms, and, in the case of Walschaert gear, combination lever union links, radius rods, etc.

A few of the important points which would have to be observed, and which would appear on the printed work report and acknowledged by the valve setter by his signature, are as follows:

When taking port marks with inside admission valves, valve stem expansion and piston rod volume must be considered and allowed for.

When placing driving wheels on rollers the height of main frames above the tops of axle boxes must be strictly observed and would be included in standard instructions, which would coincide with drawing office blue print dimensions.

When finding dead centers, consideration of exceeding side play in cross heads, as well as main rod slack motion allowed to slip by slightly and let go, but should be caught first time properly. Dead centers to be found with use of main rods only.

When tightening horn binders, setting up axle box wedges, driving home cotters or adjusting main rod wedges, equalizing side play in the main driving wheels or taking the weight of drivers with a correct blocking up of spring gear with consideration for axle boxes and their journals, etc., a little concentration of mind to the work in hand is necessary. In some cases there seems to be a tendency to neglect somewhat the points just mentioned.

Boiler expansion effect on valve gear must be allowed for when setting valves.

When measuring lead during valve setting only it must be considered collectively, but when measured for a report same must be measured separately for each steam port.

The reverse gear position, when setting valves, must be taken from standard instructions which would also contain information respecting valves being set by the full gear lead lines or specified cut-offs in the case of Walschaert gear; valve travel lines or specified cut-offs in the case of Stephenson gear for the class of engine the valves of which are being set.

In Stephenson gear, temporary adjustment of the eccentric rods from valve travel lines is generally made and then cut-offs are taken to prove setting, and, if necessary, final adjustment is made, where as in the case of Walschaert gear, co-operation with the blacksmith, as far as the eccentric rod alteration is concerned, pays before taking the cut-offs to prove setting even if a second alteration to eccentric rods is necessary to finally adjust cut-offs.

It is policy for valve setters to check every change that is made to valve gear parts requiring adjustments before and after such change is made in the machine or blacksmith shop.

One often hears the remark: "What does a sixty-fourth count?" Maybe it is inconsiderable in some instances when it stands alone, yet in some cases it counts a great deal. When the slightest negligence occurs in the several parts of the same engine it may happen by mere chance that the disregard of one small difference adds to each and every other small difference, and the result is very marked when the locomotive goes into service, yet on the valve stem reading nothing out of the way is noticeable.

The errors unseen may occur as follows: With an inside admission valve its valve stem expansion of $\frac{1}{32}$ inch may be forgotten and the volume of the piston rod at back end of the cylinder may be neglected, which together count for an inch and a half difference in the cut-off. When finding a dead center the side play to the piston crosshead and the lost motion in main rod is very likely not considered. Driving horn binders not being tightened and the setting-up of the driving axle box wedges being disregarded, thus allow for an incorrect dead centre and even when dead centers are found, when in the act of catching one it may possibly be allowed to run by slightly and let go. The setting up of the driving wheels which occupy the rollers, to the blue print distance from main frames on both sides during valve setting, cuts some figure with the lead and the correct setting of the eccentric crank arms or sheaves, as the case may be.

Striking a mean effect on lead and valve travels for a given change of reach rod of lifters amounts to something, but if this is neglected and is out $\frac{1}{64}$ inch and is allowed to pass just because a $\frac{1}{64}$ inch does not count for much, can it be wondered that a valve stem reading appears to be right, and when the locomotive

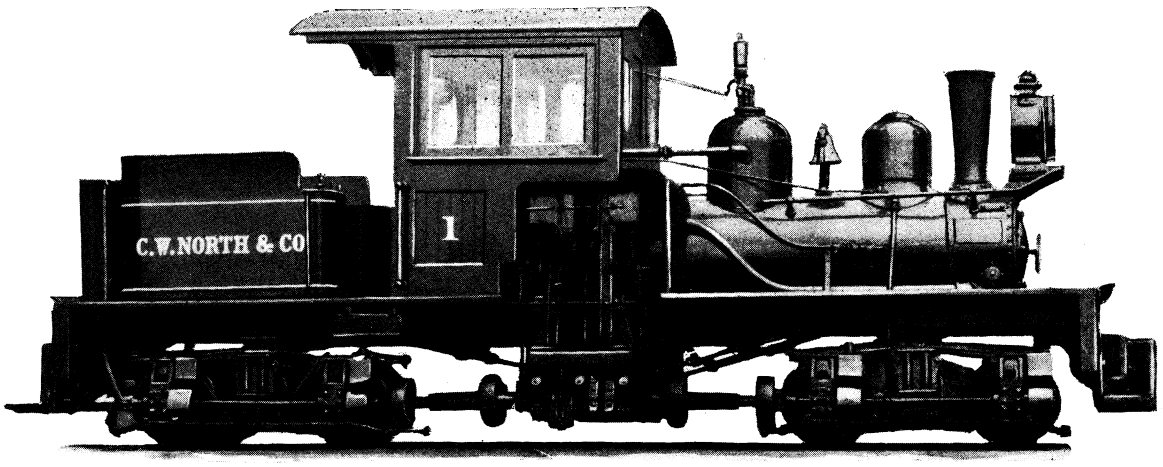
(continued on page 9)

Shay Locomotive in Road Work

THE Shay locomotive was patented many years ago to answer the great demand for a locomotive which was capable of handling heavy train loads on light rails, over steep grades and on rough track which was as a general rule temporary and moved frequently, during all kinds of weather conditions.

Immediately upon this locomotive being put on the market its adaptability for these uses was realized by the lumbermen first as they had the greatest need for a locomotive to operate under these adverse circumstances. Next the railroads realized its advantages, then the quarry men and all kinds of industrial plants and now the contractors, by taking on longer contracts, have created exactly the same conditions that baffled the others but their troubles have already been figured out in advance for them. They do not have to experiment as the SHAY has been perfected to the highest degree possible at this time, thousands of them have been built and they are working in all parts of the world today.

Highway construction is really, you might say, in its infancy, but its possibilities are unlimited, and the man who gets in first with the proper equipment has an advantage which will be hard to overcome.



13-ton Shay in Road Work by C. W. North & Co., Bluffton, Ind.

The road contractor started to use horses for his motive power but it was not satisfactory and when you stop to think of it, it does seem lacking as some experts declare that the average farm horse cannot be depended upon for more than 13 to 15 miles of pull per day nor more than 4 to 6 hours of work per day. Then comes a hard rain. That positively ends the matter for a few days and these delays cost real money.

The contractor was dissatisfied as well as the people living along the delayed work, there was a continual kick and unpleasantness developed fast.

Then he starts out to find something to take the place of the horse. The locomotive has already been devoloped and perfected. Now for a track to run it on. No more roads torn up putting down a new one, no more delays on account of rain, and a great saving in time and money, as well as securing larger contracts. The light portable track answered this need and the idea was a fact.

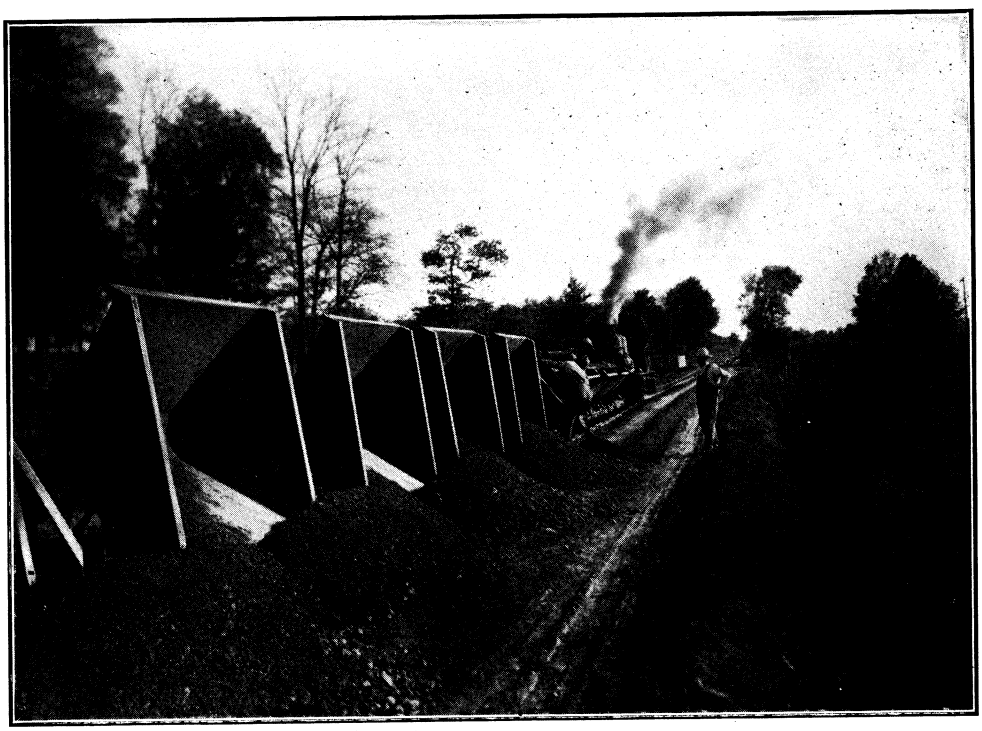
Generally the first idea that puts the notion of a railroad in the mind of a contractor is the fact that he has some heavy grades to contend with. This should not be the case as the railroad system of handling material is just as efficient for level roads as for the ones with grades, but on the so called level ones it is seldom that considerable grades are not encountered.

The Shay locomotive is built with two four wheel center bearing swivel trucks and is driven by a flexible line shaft and the locomotive has two cylinders on the smaller sizes, which supplies the power. The trucks constructed in this manner makes the locomotive very easy on the tracks. If one of the trucks strikes a depression the other truck maintains the equilibrium of the locomotive and it takes the rough track with the same ease that a mainline railroad car

Twenty-five foot radius curve being negotiated by 13-ton Shay on C. W. North & Co. work.

Dumping Cars on road. H. W. Reed & Son Construction Co. job at Mishawaka, Ind.

Method of loading Small Cars from Hopper Cars.



Another view dumping cars on road.

would. The entire weight of the locomotive being on these two trucks and every wheel being a driver it is possible to develop a very large tractive effort and being geared it is able to negotiate very heavy grades. We herewith show a photograph giving a good view of some of the track on which these locomotives are operating.

Owing to the large heating surface as well as a deep fire box which allows you to secure extremely good combustion of fuel it uses a very small amount of coal. The coal bunker holds ¾ tons.

The standard tank holds 400 gallons and you are not delayed by taking water every few minutes. It is also equipped with a siphon and hose through which you can fill the tank from a trough or creek in a short time.

Track on which Shay Locomotive operates satisfactory.

All of the machinery being on the outside it is very accessible for any attention which may be necessary from time to time.

Most of this equipment is used for laying the track and beginning work by hauling to the extreme end first. Then after the first course is on it is rolled and the succeeding courses distributed. By this means it is not necessary to haul over the first course and cut it up and ruin your foundation.

The car used is usually of the 1½ yard, side dumping type. The track is 24" gauge 20lb. steel and two men handle a section. It is quickly put together and rapidly laid.

The curves are 25′ radius but are easily negotiated by the Shay locomotive and these dump cars.

There is not a single feature in the construction of highways to which the Shay is not adapted and no complaint has been made regarding disadvantages whatsoever.

The speed usually made are from 6 to 8 miles per hour.

It has been customary to push the cars ahead of the locomotive and in cases where there is a very heavy grade to divide the train placing the locomotive in the center of the train and taking half up the grade at a time.

The manner of loading the cars of course depends to a great extent upon conditions. One of the means employed is to use a bin and elevator, running the small cars under the bin for their load but a very simple, quick and cheap way to accomplish this was seen a short time ago. There was a small excavation under the side track and the dump car run under the hopper of the car where there had been constructed a small hopper with a sliding trap in the bottom through which the material was allowed to flow. When the car was filled it was drawn to the level by a pair of horses and placed on a side track where the locomotive picked them up when an entire train was ready. There is a cut showing this means of loading.

The use of the locomotive in road work has been recognized by everyone and where it is necessary to cross a mainline railroad they have been allowed to do so by maintaining a watchman at the crossing and using a section of rail which is removed after the construction train has crossed.

Material has been placed on the roads very cheaply using this method and half the cost of hauling with teams is very conservative, and the work has actually been accomplished for one quarter of the cost.

There can not be the slightest doubt in any one's mind about the advisability of this manner of highway construction if they investigate what is being accomplished by the contractors who have been the pioneers in using the Shay locomotives in building good roads.

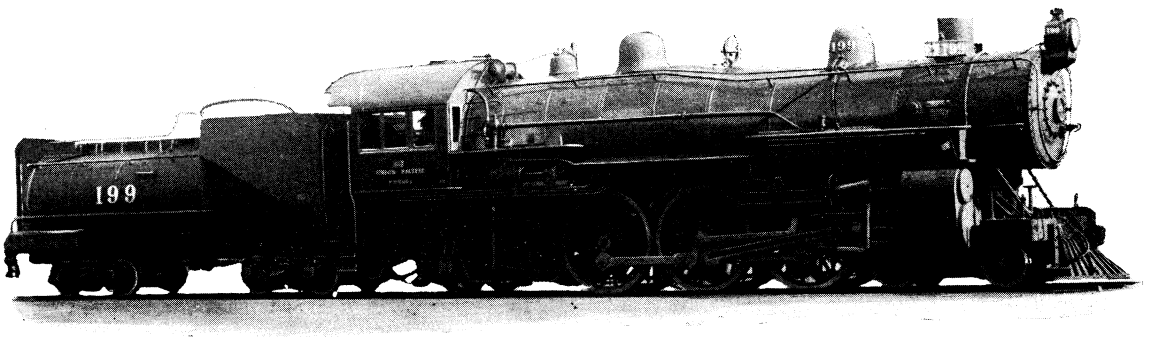
Pacific Type Locomotives for the Union Pacific

A few years ago a number of standard locomotives were designed for service on the Union Pacific.* Since that time this road has developed and standardized a heavier Pacific type locomotive to handle the increased weights of passenger trains and the increased volume of mail; 25 of these locomotives have been built by the Lima Locomotive Corporation.

The engines were intended to provide greater sustained power at high speed, and are a distinct advance over the Pacific type locomotives previously referred to, the tractive effort being 38,600 lb., as against 29,900 lb. for the older engines, while the diameter of the cylinders has been increased from 22 in. to 25 in. The stroke, diameter of drivers and boiler pressure were not changed. With the 29 per cent increase in tractive effort the total weight of the engine was increased from 221,100 lb. to 273,500 lb., or 23.7 per cent. The boiler was changed from the straight top to the wagon top type, the outside diameter of the first ring being increased from 70 to 74 in. The length of tubes was increased from 20 ft. to 22 ft. Superheaters were applied in both cases and maintain substantially the same ratio to the total evaporative heating surface. The larger boiler, however, provided an increase in the total evaporative heating surface of nearly 50 per cent in the total equivalent heating surface. In addition to the increase in power, there is thus provided a substantial increase in the steaming capacity in order to take care of the sustained speed requirements.

These locomotives are distributed over the main line district, from Omaha, Neb., to Ogden, Utah, and on the west end of this line there are many grades averaging 0.7 per cent. The engines maintain time card speeds of 41 miles per hour with from six to eight heavy storage mail cars, and on one occasion a run was made from North Platte, Neb., to Omaha, a distance of 291 miles, in 290 minutes, including six stops.

In the detail construction of these locomotives interchangeability of parts has been very carefully considered, a large number of the parts being duplicates of those used on the road's Mikado type engines.



Latest developement of the Pacific Type Locomotive on the Union Pacific.

The engines are equipped with the brick arch Schmidt superheater and power reverse gear. The Walschaert valve gear, which is the standard of the Union Pacific, is also employed. The main valves have a travel of 6½ in., with 1¼ in. lap, ¼ in. lead and ⅛ in. exhaust clearance. With the increased length of boiler it was necessary to increase the total wheel base of the engine 2 ft. 4 in. over that of the previous Pacific type; the driving wheel base, however, was maintained at 13 ft. 4 in., the same as in the previous engines.

The following table gives the principal dimensions and ratios of the old and new Pacific type locomotives:

General Data

	Old Pass.	New Pass.
Service		
Fuel	Oil	Coal
Tractive effort	29,000 lb.	38,600 lb.
Weight in working order	221,100 lb.	173,500 lb.
Weight on drivers	141,500 lb.	164,100 lb.
Weight of engine and tender in working order	382,000 lb.	440,000 lb.

*For description see American Engineer, January, 1913, page 5.

General Data—(Continued)		
Wheel base, driving..	13 ft. 4 in.	13 ft. 4 in.
Wheel base, total.....	33 ft. 4 in.	35 ft. 8 in.
Wheel base, engine and tender.....	68 ft. 6¼ in.	70 ft. 3¼ in.
Ratios		
Weight on drivers ÷ tractive effort	4.72	4.25
Total weight ÷ tractive effort.....	7.36	7.09
Tractive effort + diam. drivers ÷ equivalent heating surface*.....	652	572
Equivalent heating surface* ÷ grate area.....	71.3	73.8
Firebox heating surface ÷ tube heating surface, per cent....	7.3	6.3
Weight on drivers ÷ equivalent heating surface*.....	40	31.6
Total weight ÷ equivalent heating surface*.....	62.6	52.7
Volume both cylinders (cu. ft.).....	12.32	15.90
Equivalent heating surface* ÷ vol. cylinders.....	286	326
Grate area ÷ vol. cylinders.....	4.01	4.42
Cylinders		
Kind.....	Simple	Simple
Diameter and stroke	22 in. x 28 in.	25 in. x 28 in.
Wheels		
Driving, diameter over tires.....	77 in.	77 in.
Driving journals, main, diameter and length.....	10 in. x 12 in.	11 in. x 12 in.
Driving journals, others, diameter and length.....	9 in. x 12 in.	10 in. x 12 in.
Engine truck wheels, diameter.....	33½ in.	33 in.
Engine truck, journals.....	6 in. x 10 in.	6½ in. x 12 in.
Trailing truck wheels, diameter.....	45 in.	45 in.
Trailing truck, journals.....	8 in. x 14 in.	8 in. x 14 in.
Boiler		
Style.....	Straight	Wagon top
Working pressure (lbs. per sq in.).....	200 lbs.	200 lbs.
Outside diameter of first ring.....	70 in.	74 in.
Firebox, length and width.....	108 in. x 66 in.	120⅝ in. x 84 in.
Tubes, number and outside diameter....	173—2 in.	210—2¼ in.
Flues, number and outside diameter....	24—5⅜ in.	32—5½ in.
Tubes and flues, length.....	20 ft.	22 ft.
Heating surface, tubes and flues.....	2,477 sq. ft.	3,731 sq. ft.
Heating surface, firebox.....	181 sq. ft.	235 sq. ft.
Heating surface, total.....	2,658 sq. ft.	3,966 sq. ft.
Superheater heating surface.....	580 sq. ft.	815 sq. ft.
Equivalent heating surface*.....	3,528 sq. ft.	5,188 sq. ft.
Grate area.....	49.5 sq. ft.	70.4 sq. ft.
Tender		
Tank.....	Vanderbilt	Vanderbilt
Weight.....	160,900 lb.	166,500 lb.
Wheels, diameter	33 in.	33 in.
Water capacity	9,000 gal.	9,000 gal.
Coal capacity	2,940 gal.	14 tons

*Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.—*Railway Age Gazette.*

Big Contracts for Engines

Over $1,000,000 Worth Ordered from One Company—Other Equipment Purchases.

Striking evidence of improved business and railroad conditions is afforded by a telegram to the MANUFACTURERS RECORD from the Lima (O.) Locomotive Corporation showing that it has received since May 1 orders for 54 locomotives, which, according to estimates based upon the average cost of railroad engines, would represent a total value of considerably more than $1,000,000. The dispatch names the following contracts: Fifteen Mallet-type locomotives for the Western Maryland Railway; 25 consolidated-type for Pennsylvania Lines West; eight Mikado-type for Denver and Salt Lake Railroad; one 42-ton Shay geared locomotive for the Angelina County Lumber Co., Keltys, Tex.; one for the Mountain Copper Co., Mococo, Cal.; another for the J. W. Veness Lumber Co., Winlock, Wash., and a fourth for the United States Gypsum Co., Raco, Mich.; a 70-ton Shay for the Yosemite Valley Lumber Co., Merced, Cal., and a 28-ton Shay for Morley Cypress Co., Morley, La.

International & Great Northern Railroad has ordered 500 box cars, 300 gondola cars and 200 stock cars from the Mount Vernon Car & Manufacturing Co., Mount Vernon, Ill.

Norfolk & Western Railway has ordered 10 passenger cars from the Harlan & Hollingsworth Corporation, Wilmington, Del., and 12 baggage and express cars and 2 mail cars from the American Car & Foundry Co., St. Louis. Orders for 5100 tons of rails have also been placed by the railway with the Carnegie Steel Co., Pittsburgh, and for 3000 tons with the Pennsylvania Steel Co., Steelton, Pa.

Chicago & Alton Railway has ordered 3000

tons of rails from the Illinois Steel Co., Chicago.

Tennessee Coal, Iron & Railroad Co., Birmingham, is reported to have received orders from the Louisville, Henderson & St. Louis Railroad for 3100 tons of rails, and from the Southern Railway for an additional lot of 1500 tons.

Texas & Pacific Railway is in the market for 500 coal cars.

Chesapeake & Ohio Railway is reported getting prices on 50 cabooses.—*Manufacturers Record.*

Ordered More Lidgerwood Skidders

A good sign of improved business conditions is the fact that the Champion Lumber Co. are adding to their equipment.

With the present outfit they have not been able to furnish sufficient supply of logs to keep their mills at Crestmont and Sunburst, N. C., in steady operation.

In their loggong territory around Crestmont and Sunburst they have several good skidders, and also six overhead skidders, three of which are Lidgerwood, one of 1,500 ft. and the other two of 2,000 ft. span. They have now ordered two more Lidgerwood overhead skidders, of a much larger and heavier type, each of which will reach out, skid and convey their logs over intervening ridges, up to 4,000 ft. reach. They have also ordered two ninety-ton Shay locomotives, and a large number of logging cars. —*St. Louis Lumberman.*

American Manufacture of Creosote Increases.

Owing to a falling off since August 1 of nearly 30 per cent in shipments of creosote from England and Germany, whence comes all but a small part of the imported oil used by wood preserving plants in this country, American manufacturers have taken steps which, says a report compiled by the forest service, it is estimated will increase production of the domestic article by about 25 per cent. The imported oil ordinarily forms about 65 per cent of the total used in the United States, where creosote is the most important wood preservative.

The statistics gathered show that wood preserving is one of the most rapidly advancing industries in the country. In 1895 there were fifteen plants in the United States; in 1914 there were 122 plants of all kinds, 100 being of the pressure-cylinder type. Ninety-four of these plants last year used more than 27 million pounds of dry zinc chloride, and nearly 2½ million gallons of other preservatives, such as coal tar and crude oil, treating a total of nearly 160 million cubic feet of timber, an increase of about 7 million cubic feet over 1913 and of 35 million cubic feet over 1912.—From Bulletin U. S. Dept. of Agriculture.—*Railroad Herald.*

(continued from page 2)

gets into service she proves to be out of square? If a man has a comprehensive view of all the details, he is in a position to know when $\frac{1}{64}$ inch deviation from accuracy is allowable and when it is not.

Advantages of the System.

It is well known that the various designs of valve gears which are laid out to meet certain conditions of service and constructional requirements, require various settings, but the system allows of an engine being taken care of and turned out in minimum time. Economy in fuel consumption is obvious.

No deviation from first correct setting of eccentric crank arms or sheaves will be necessary. When valves are set the cut-offs are generally taken, especially by a new machinist, or when an old hand is not sure of his engine in order to prove valve setting. This time would be saved in many cases with a system.

Establishment of a general understanding, which would eliminate cost of further re-adjustments at outside points owing to a difference of opinion, also rule of thumb practices would be dispensed with.

Elimination of certain objectionable features which are pronounced in the tendency of a certain few to monopolize the work of valve setting.

The extent to which the information sheet for each class of engine would reach would depend entirely upon that which practical application proved worth while. If one decided to run to the extreme, a valve setter with average intelligence would not have to understand anything outside of his steel scale.

If there were included on printed information sheets, the effect and boiler expansion on reach rods, lead, full gear and hook up valve travels, etc., the uninformed would be saved the time and trouble of looking up and finding same.—*Railway Review.*

Lima Locomotive Corp. London Office

An office has been opened at 18 Coleman Street, London, England, by the Lima Locomotive Corporation of Lima, Ohio, U. S. A. Mr. James Halcrow has been appointed agent in charge of this office. The Lima Locomotive Corporation has recently enlarged their plant, installing the most modern and up-to-date locomotive building tools, and has increased their capacity to 900 locomotives per annum. Any communication addressed to London Office will be promptly handled by Mr. Halcrow. Catalog mailed upon request.

New Booklet

"The Powell Accessories" is the name of a small booklet just received from The Wm. Powell Co., Cincinnati, O. This booklet describes valves and fittings for air, gas, oil or water. A copy can be had by writing The Wm. Powell Co., Cincinnati, O. the home of the celebrated "White Star" valve.

INDEX TO ADVERTISERS AND WHAT THEY HAVE TO SELL

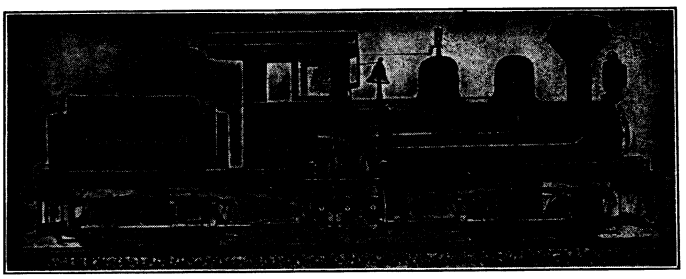
SECOND HAND LOCOMOTIVES

This
18 Ton
Second Hand
Shay Locomotive

For Sale at a
Bargain

Write
or
Wire for
Full Particulars

Reference No. 137



This Locomotive is built for 56½" Gauge

PARTIAL LIST OF SECOND-HAND LOCOMOTIVES

	Tonnage	Type	Gauge	Location	Reference No.
1	55	Shay	56½"	New Mexico	0832
1	65	Shay	36 "	New Mexico	083
1	65	Shay	56½"	New Mexico	0831
1	40	American	56½"	Alabama	134
1	24	Shay	42 "	Pennsylvania	138
1	24	Shay	36 "	Pennsylvania	0138
1	30	Shay	56½"	Pennsylvania	139
1	42	Shay	56½"	Louisiana	140
1	50	Shay	56½"	Wisconsin	141
1	45	Shay	56½"	Vermont	142

Write for full information and price on the above Equipment

THE LIMA EQUIPMENT CO.

LIMA, OHIO